THE ELECTRICAL WORLD

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The Stabler Individual Telephone Call.

The art of transmitting articulate speech by electricity is one of the most wonderful and most useful applications which have resulted from the endeavor of man to make electricity serve his convenience or promote the advance of civilization, and yet it is one of those which draws to the least extent upon the vast resources of this subtle agent. The telephone, considered by itself, is indeed a very simple device, and its function involves comparatively simple electrical actions. But, while the art of transmitting speech by electricity is so simple in its essence, the full development of its usefulness as a means of intercommunication between the inhabitants of a city prescribes peculiar methods of adaptation which necessarily entail a certain amount of complication. It is not enough that the telephone should provide communication between two points merely. On the contrary, its convenience and its utility for business or social purposes depend on the facilities it affords for communicating with several points, the more points the greater the utility. To furnish these facilities is the object of the "telephone exchange," embodying a certain method of grouping and arranging the stations and certain appliances for signaling and making the connections. Now it is precisely in these details of adaptation that the most attention has been required. It is here especially that the thought and the skill of the inventor have been of use, for the questions of cost and efficiency, which interest the subscriber and the telephonist alike, depend upon the value of the improvements in the devices and the methods of "operating" the exchange. Inventive effort has brought about much improvement in the construction and operation of telephonic apparatus. In some devices—the details of exchange switch-boards for instance—there has indeed been a succession of improvements such that a high degree of perfection has been attained and but little more is to be desired. But, however excellent the facilities of telephony may be in these respects something more is required. The art is one whose scope and usefulness should be unbounded, and for this additional facilities are needed. It is for the purpose of providing these facilities that the modes and devices for signaling subscribers have been made the subject of special study by some inventors, together with other details. The resources available for signaling subscribers from a central office become in many cases an interesting and important factor, for they influence the number, the distribution of the circuits and the grouping of the stations. The purpose of invention, in this connection, is by remedying defects and supplying deficiences in the devices used, to render new resources available which not only bear directly on the convenience and cost of construction or maintenance, but in many cases on the growth of the exchange itself. The "individual telephone call," one form of which we propose to describe in this article, is the outcome of this purpose. A brief review of the difficulties of telephonic signaling will serve to show its usefulness.

The object to be accomplished by a telephone signal is merely to attract the attention of the subscriber with whom telephonic communication is desired. For this purpose, the telephone itself, though it cannot "speak" loudly enough, as ordinarily made, can yet be made to produce a sharp cracking noise that may be heard at some distance. This method of signaling was used at first, notably with the Gower-Bell telephone in Europe. The electric bell suggested itself as the most practical signal, however, and it was adopted to the exclusion of all other signals. As a means of signaling between two stations at either end of a line or between a station and the exchange the electric bell answered every requirement satisfactorily. It was not under such conditions, however, that it was most often used. Economy, both in cost of construction and of repairs, made it very desirable that the same line should answer for several stations, especially when these were grouped together and situated at a considerable distance from the exchange. But, unfortunately, with a number of stations on each line, the electric bell proved less suitable. The impulses of current sent over the line from any station acted upon the bell in every station. It became necessary, therefore, to establish a code of signals and to distinguish the stations by the number of taps of the bell, or by the order of the sounds. Many readers, doubtless, remember the annoyance which a station included on a "busy circuit" would suffer from the constant ringing of the signal-bell. The subscriber could only determine whether he was wanted or not by listening to each call to see if it were the right one or not, and oftentimes when he responded to what sounded like the right signal it was only to learn that it was a "mistake" in calling, while the errors from misunderstood signals were more or less frequent. Moreover, under this arrangement, it was possible—and often probable—that the subscriber speaking from one station would be interrupted by another station on the same line attempting to signal at the same time, and it was not impossible that the conversation might be "appropriated" by some of the other stations. Telephone service obtained under such conditions was evidently not a very desirable "con-

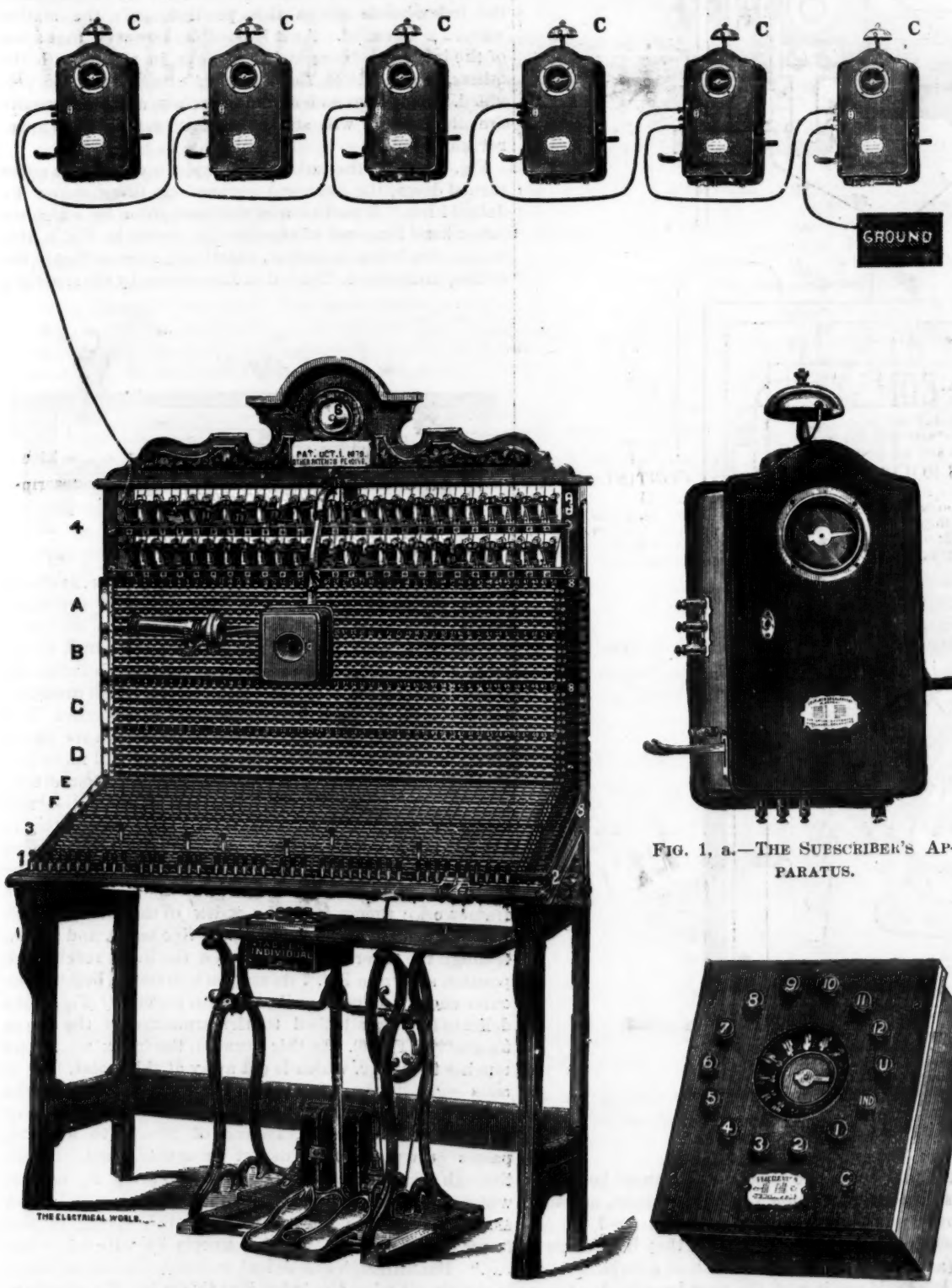


FIG. 1.—THE STABLER INDIVIDUAL SIGNAL SYSTEM.

FIG. 1, a.—THE SUBSCRIBER'S APPARATUS.

FIG. 1, b.—THE CALLING INSTRUMENT.

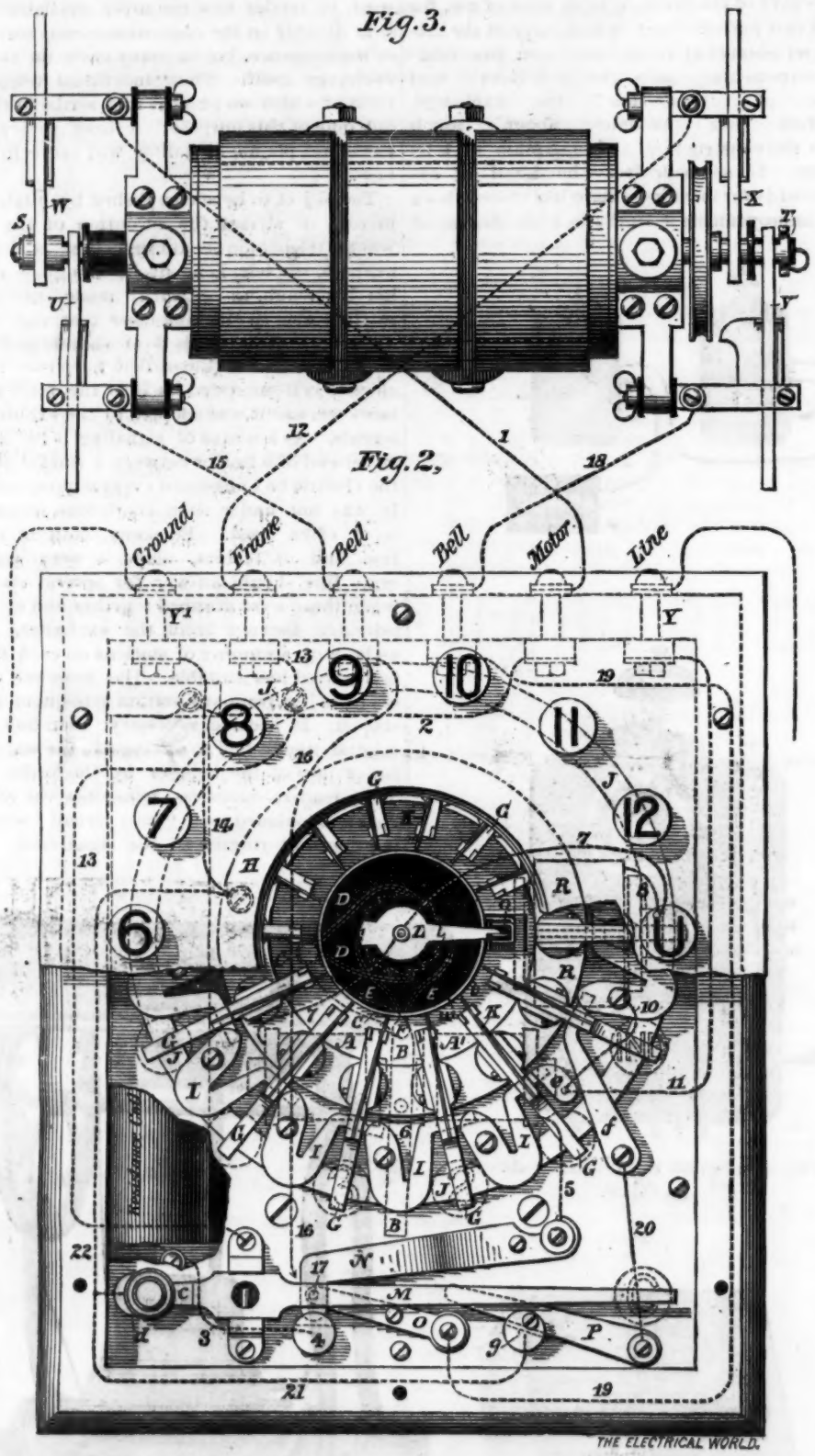
FIG. 1, c.—THE CALLING APPARATUS COMPLETE.

venience;" it had scarcely anything more to recommend it than novelty.

It did not take telephonists long to recognize the necessity of a change of procedure or of system whereby these difficulties could be avoided. One of two things had to be done; either some new calling device must be produced which could enable the operator to signal each subscriber on a given line "individually," without disturbing the others, or failing this, the only alternative was the total abandonment of the "circuit" or "combination" line. The first remedy, if procurable, was evidently more desirable than the second, for it did not entail the complication and the expense of putting up separate lines, a circumstance which necessarily increased the cost of service and limited the growth and extension of the system.

The desirability of an "individual call system" being recognized, many inventors bent their skill toward the perfection of such a system. The first devices tried, however, were so crude and imperfect that they fell far short of success. Meanwhile, since the circuit line had become as intolerable as it was unsatisfactory, the plan of using a special circuit wire for each subscriber's station was inaugurated. This plan afforded satisfactory service, but it of course necessitated the placing of the service rate at a higher figure. Had a good reliable individual call system been forthcoming then it is probable that it would have been widely adopted, in preference to this more costly plan. But the repeated failures of the individual call devices produced at that time led telephonists and telephone companies to despair of the practical solution of the problem, and the result has been the general adoption of the special wire system of circuits. In some cases a few combination circuits with lower rates are retained; but it is the exception rather than the rule, for the disadvantages incident to the "combination service" are so great, as we have just shown, that only few subscribers care to accept it, preferring to dispense with the telephone altogether. Its deficiencies make it equally unpopular with telephonists, for the blame is "of course" credited to the exchange in every case. It is rather unfortunate that the adoption of the special wire system should have taken place under such conditions. The fact that it was a kind of necessity at the time of its adoption, and also that it has remained in undisturbed possession of the field for a long time, has produced a little conservatism in its favor among telephonists. This is an obstacle as serious to the introduction of the "individual call"—now that the problem has been successfully and practically solved—as the prejudice engendered by the failures of the early attempts above mentioned. It cannot be gainsaid that the special circuit system is in some respects an elegant and satisfactory solution of the problem of giving good service to the subscriber. It is not without its faults, however, irrespective of the point of economy, for the multiplication of circuits which it requires is the source of many "crosses" and "grounds," which often disturb the equanimity of the subscriber quite as much as they try the patience of the lineman. It cannot be denied in any case that this solution is dearly bought, and that the high rates which it prescribes have restricted the extent of usefulness of the telephone, that they have made it a luxury, and placed it out of the reach of a large number of those who could use it with the most benefit. It cannot be doubted, moreover, that with the resources now placed at our command by the solution of the problem of individual signaling, a service equally efficient, if not more so, can be placed within the reach of a vastly larger number of subscribers at a lower rate, though in point of fact this service would be of more value and utility to the subscriber, since these qualities increase directly with the number of subscribers to the exchange. In short, the individual call is just as much desirable to-day as it was in the early days of telephony, for it is just what is needed to make the telephone more valuable to the companies and more useful to the community.

Fig. 3.



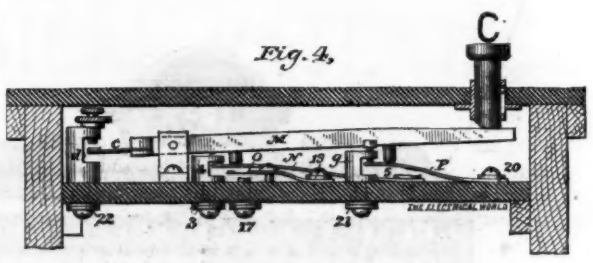
CONNECTIONS OF CALLING INSTRUMENT AND GENERATOR.

The Stabler individual telephone call system, which we illustrate herewith, is therefore of considerable interest in this connection, because it satisfies, perhaps for the first time, the severe conditions of the problem of individual signaling. That the devices should be reliable in the performance of their function is indispensable, but it is not enough. Ready adaptability to the telephone exchange as we find it to-day is evidently an important requisite also. But the character of the service afforded is the great criterion of merit. The service should be individual in the strictest sense; that is to say, only the station wanted must be called, and, what is of greater importance, only the station wanted must be given telephonic communication with the office at one time, so that none other on the same circuit can possibly interrupt or interfere. At the same time there should be facilities so that one station can be connected with another on the same wire should occasion require it. The Stabler system affords these advantages without complicating the working of the exchange.

The principle of this individual call system is that of step-by-step motion. On depressing one of the numbered keys or press buttons disposed in a circle on the surface of the calling instrument (Fig. 1 *b*), an index-hand in the centre of this circle begins to move in a step-by-step manner until it points at the key depressed. At the same time the index-hands of each subscriber's apparatus (Fig. 1 *a*) have moved the same number of steps simultaneously. In this situation the index-hand in the station wanted completes a circuit through the bell, which does not ring, however, until the "call key" C of the calling instrument is depressed. As none of the bells at the other stations are in circuit when the index-hands are in this position, only the station wanted is signalled. As it is possible, however, that some of the index-hands might fail to move in accord with the others, some devices for effecting unison must be provided. In order to understand how these and other results are obtained we will study the construction of the apparatus in detail.

Fig. 7 shows the subscriber's apparatus with its cover turned down, the electrical connections being shown by dotted lines. A plan view of the mechanism by which the index hand is moved or regulated is shown in Fig. 6, this mechanism being, moreover, exactly the same as that in the calling instrument. The index *L* is carried by the shaft of a

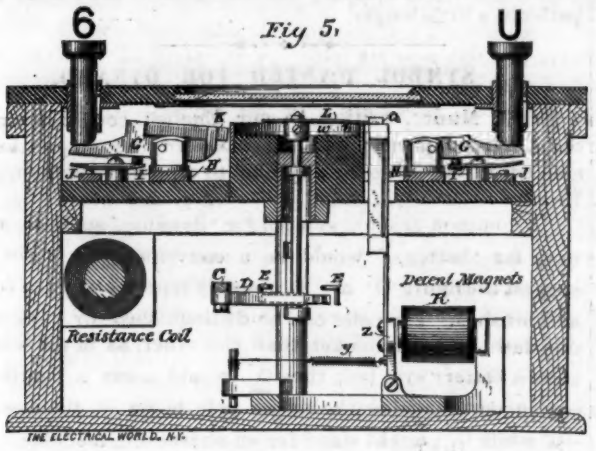
Fig. 4.



toothed wheel placed behind a disc *w* of vulcanite, as shown by the dotted lines in Fig. 7. The motion of the wheel is caused by a double pawl, which is attached to an arm *c*, prolonged upward from the armature *B*, and which moves from side to side as the armature *B* oscillates between the poles of the motor magnets (*AA'*, Fig. 6). This armature (*B*) is polarized, consisting of a permanent U-magnet. It is plain, therefore, that when *alternating* currents are passed through the motor magnets the index-hand will move in a step-by-step manner. The vulcanite disc is surrounded by a brass rim *v*, which the outer end of the index-hand touches as it turns. If we suppose the hand to be pointing to the left instead of the right, and we follow the connections from *h* ("line in") we find that the circuit is through the motor magnets and thence to the index (through the framework); thence from the index to the rim *v* through wire 24 which at 3, leads to *n* ("line out"), and thence through the other stations. When the index reaches the position shown in Fig. 7 its motion is arrested, because the outer end of t ie index strikes against the end *Q* (Fig. 6) of a delicate spring attached to the armature of the detent magnets (*R* Fig. 6). In this situation the index no longer touches the rim *v*, which is cut away at this point, but it rests against the edge of a strip *i* inserted in the vulcanite disc *w*. The circuit in this situation is very different. The current, instead of passing to wire 24, passes through the detent magnets and thence through wire 1 switch lever *j* to spring *k*, against which it rests when the telephone is suspended, and from this through wire 3 to contact *l*, spring *m* and frame of the magneto, which connects by wire 3 to "line out." But although the detent magnets become included in the circuit when the index is at this point, the armature *Q* does not move. The alternating currents used are not very strong, and they cannot overcome the spring holding this armature back (shown in Fig. 6). It is only when *stronger* current impulses *of one direction* are passed over the line that the armature *Q* is pulled to the right out of the way of the index hand. This furnishes an easy means of effecting unison, for supposing for instance that some of the index hands have been held back, or lagged behind accidentally, by allowing the alternating impulses, to pass for a time sufficient to cause an entire revolution of an index hand, the most backward one will arrive to the "unison stop" at *Q*, while those that had arrived there sooner, being forcibly held, cannot proceed further. When now the operator sends the stronger impulses the detent magnets are operated sim-

ultaneously in all the stations, and the index hands are all released together and are consequently in unison. The end of the index is sharpened so that as the armature falls back the little flat spring at *Q* will be sure to slide *above*, thus leaving the armature free to move around again when the alternating currents are passed over the line." This is the normal position of the index hand, and the subscriber seeing the index at this position knows that the line is "not in use." If he desire

Fig 5.

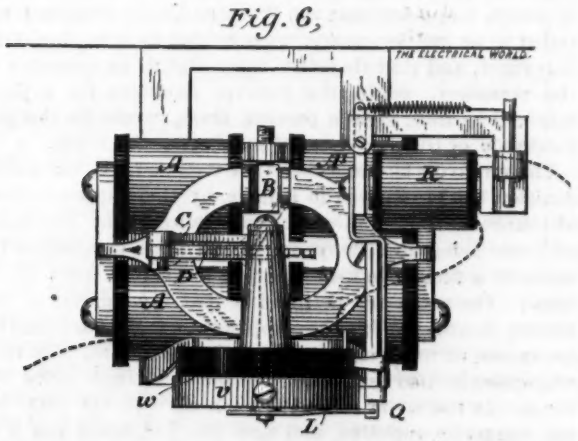


to call the exchange he turns the generator crank, and presses the button *O* and thus breaks contact at *l m*, by which the armature of the generator was short-circuited. The circuit is from "line in" (*h*) to motor and detent magnets, wire 1, switch *j*, spring *k*, wire 2, spring *p* through armature, to frame of generator, from which it leads to wire 3 and to "line out." The magneto gives impulses of current of *one* direction only, so that the motor magnets are not affected at any of the stations. This is effected by short circuiting one of the alternate currents of the armature. For this purpose the spring *z*, which makes contact with a pin on the armature shaft during half of each revolution, is connected by wire 23 with spring *p*. When the subscriber takes down his telephone, the switch lever *j* is pulled upward by the spring (partly removed in Fig. 7), the circuit is broken at *K*, but it is closed at spring *q*, through wire 4, through transmitter, wire 5, to post *r* through wire 6, through the telephone and thence by wire 2 as before.

The exact manner in which each station is singled out will now be described. As the index hand moves away from its normal position and swings around it arrives at another point where the rim *v* is also cut away and where another strip projects similar to that at the normal position. In Fig. 7 this strip is seen at *s*, near the strip *i*. It is through this strip that the signal bell becomes included in the circuit. When the index hand *L* touches upon this strip, technically called "bell shunt," to distinguish it from the strip *i* or "unison shunt," the circuit is from "line in" to motor magnets, index hand, shunt *s*, wire 7 spring *x*, hinge *t*, wire 8 to the signal bell, wire 9 to hinge *u*, thence to switch *j*, wire 2, etc. In this situation the bell is included in the circuit; but it does not ring, the retracting spring of its armature being adjusted in the same way as in the detent-magnets, so that the bell responds only to the stronger current impulses.

These strong current impulses are sent on the line when the operator depresses the call key **C** of the calling instrument. In station No. 1 the bell shunt would be placed just as it is shown in Fig. 7. In station No. 2 a little further to the left; in station No. 3 a little further still, and so on. The calling instrument and subscribers' apparatus as now made would admit of twelve stations being included in the same circuit. It is easy to understand now that when the

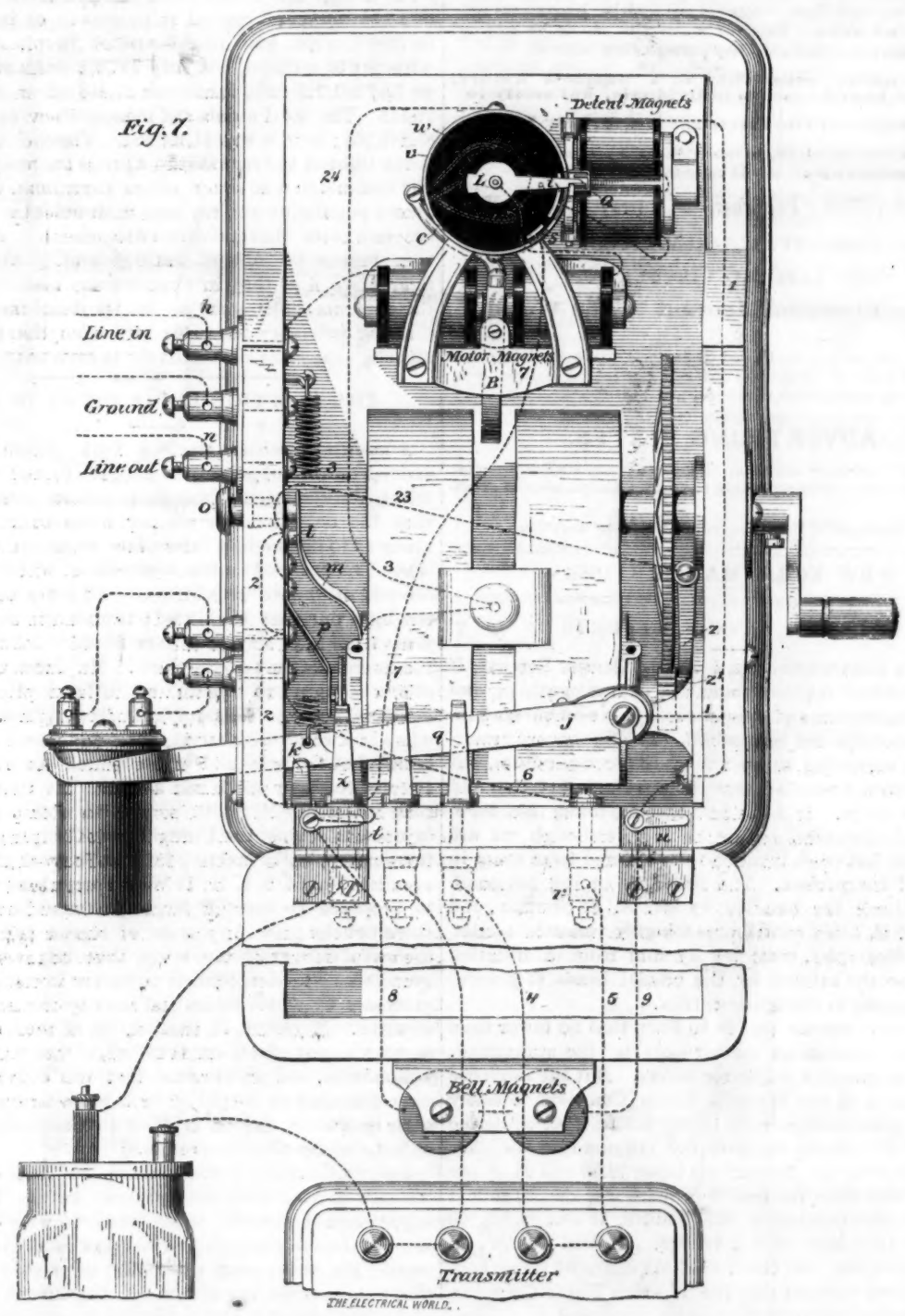
Fig. 6.



indexes are all at a given position on the dial, as they invariably are when the apparatus is properly operated, only one station can be called by depressing the call-key **C**, for the evident reason that only one index hand is in contact with a bell shunt. The index hands at the other stations are all in contact with the rim *v* of the vulcanite disc, and the bells and telephones are consequently out of the circuit. Thus, as the index hands move around a complete turn, the bell shunt, at No. 1, will be first brought in contact, then the bell shunt at No. 2, at No. 3, and so on to the last. Each bell is therefore successively introduced into the circuit for an instant, but as the bells are adjusted to respond only to the stronger current they remain silent. It is important, however, that the index hands should all stop exactly at the point desired by the operator. For instance, if the motion of the hands proceed a whole space further than No. 2 on the disc *w* the shunt of No. 3 is brought into contact, or if the hands move only half the space between 2 and 3 neither would be in contact. This is effectually provided against, however, by the construction of the calling instrument, which is such that alternating currents are automatically excluded from the line the instant the desired point is reached by the index hands. When a subscriber answers to the ringing of his bell, he takes down his telephone, and the motion of the switch *j* automatically brings the telephone into the circuit, the connections from index hand being through wire 7, spring *x*, switch *j*, spring *q*, wire 4 to transmitter, and thence as when the index hand touches the unison shunt. The contact of switch *j* with spring *x* makes continuous contact with this ring. In this way when connections are made with the brushes *W*, *X*, an alternating current is obtained from *one* of the armature coils.

The brush *U* bears on a segment extending laterally from ring *S*, in such a manner as to make contact during one-half of each revolution of the armature. The brush *V* makes contact with a similar segment *T* at the opposite end of the shaft, and to this segment the outer end of the second coil is connected. The brushes *U* and *V* correspond therefore to the outer ends of the coils. If the connections are made between the brush *X* and brush *U*, intermittent impulses, all of the same direction, will be obtained from one of the coils; likewise if the connections are made between brush *X* and brush *V* intermittent currents will be obtained from the other coil. If now the brushes *U*, *V*, are electrically connected together in the act of closing the circuits both coils will then be connected in parallel or divided circuit. In other words, the two circuits will assume the same relation as those in the two

Fig. 7.



CONNECTIONS OF SUBSCRIBER'S APPARATUS.

at the same time shortcircuits the bell magnets. As the index hands in all the other stations are in contact with the rim *v*, it is evidently impossible for any other station to steal the message.

We come now to the devices used in the central office for producing and controlling the currents. We have seen that the currents used are of peculiar character. First the motion of the index hand is brought about by means of alternating impulses of rather weaker character, and, second, the detent magnets and the bell magnets require current impulses of one direction only and of much greater power. These two kinds of current are both supplied from a special form of magneto-generator which resembles in outward form the usual type of "power generator" used by telephone exchanges, though it necessarily differs somewhat in construction and in the connections. These peculiarities will be understood by reference to figure 3. Upon the armature are two coils wound in the same direction, with their inner ends connected to its axis, which is prolonged outwardly, and with which the brush *X* is in continuous electrical contact. The outer end of one of the coils is connected to an insulated commutator ring *S* at the other end of the shaft, and the brush *W* halves of a Gramme armature. The internal resistance of the armature becomes reduced to one-half of the resistance of each coil by this procedure. As the resistance of each coil is approximately 2,700 ohms, it is readily seen that a large increase in strength of current results from such a great reduction in the circuit resistance (1350 ohms).

When these "stronger" currents are to be used, moreover, the circuit resistance is further decreased by excluding a resistance coil through which the alternate currents are always made to pass.

This generator may be located near any source of power, or where power is not available it may be worked by means of a treadle by the operator, though power is greatly preferable. The arrangement shown in Fig. 1, c is very convenient in such cases, it being in fact the complete outfit needed for each switch-board. The table is 18 × 24 inches, and the calling instrument is let into its top. The generator is suitably mounted beneath, and it receives power from the motion of the treadle. The height of the table may be adapted to suit the switchboard or the convenience of the operator. Fig. 1 shows this arrangement as applied to a "Standard" switchboard, to

(*Continued on page 78.*)

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BELATED CENSUS REPORTS.

We have received volume 4 of the Census Reports, it being that which relates to agencies of transportation and contains the statistics of steam railroads, steam navigation, canals, telegraphs and telephones. The figures are practically those appearing in part 2 of the compendium, but are, of course, presented now in a more interesting and instructive shape. It is to be borne in mind that these figures, unfortunately, belong to 1880, although we are now in 1884, but there is much to be learned from them in the way of comparison. The statistics of the telegraph and telephone are handled by Mr. A. E. Shuman, and Mr. Robert B. Lines contributes a highly valuable section on postal telegraphy, compiled by him from information furnished on the subject by the official heads of government telegraphs in foreign countries.

It will surprise some people to learn that no fewer than 77 telegraph companies made report to the authorities. Probably the number is greater to-day. But the immense preponderance of the Western Union Company is easily seen. Its gross receipts were nearly $13,000,000, while the total of all the others together did not amount to more than $4,000,000, the proportions being 76.56 and 23.44 per cent. At that time its length of wire was 233,534 miles; that of the other companies, 57,679 miles. It sent 29,215,509 messages; they sent only 2,487,672. It had 10,600 employés; they 4,328. But the times have changed since then, and in spite of the fact that the Western Union Company has, by swallowing rival companies, increased its mileage of wire to 432,000, and now handles 40,000,000 messages annually, it would seem likely that the preponderance of the company has been greatly diminished. The Atlantic & Pacific, the Baltimore & Ohio, the International Ocean and the Northwestern were then the only noteworthy companies outside the Western Union; but now the Baltimore & Ohio Company has developed wonderfully, while the Postal Telegraph Company and the Bankers & Merchants' Company are playing a by no means unimportant part in the competition. One little point is noticeable. The average receipt for each message in the census year is put at 42 cents. Last year the average cost to the public of a message sent by Western Union lines was 38 cents.

The statistics of the telephone are far from being as full as those of the telegraph, but as Mr. Shuman points out, in 1879–1880 the telephone business passed through the stages of an unprecedented development. It was in its infancy at the beginning of 1880, but before the year closed it had become one of the great interests of the country. The tables give 148 companies and private concerns, which aggregated 34,305 miles of wire, 54,319 telephones and 3,338 employés. The rate of growth since then is seen in the output of telephones—56,755 in 1881–82, 62,705 in 1882–83, and 57,338 in 1883–84. Allowing from 50,000 to 60,000 telephones for 1880–81, we get a total of close upon 300,000 telephones in use. The growth comes out in other figures. It would appear that 348 exchanges were included in the report. The number of exchanges named in the February, 1884, list of licensees of the Bell Company is considerably over 500, and the starting and terminal points are also given of over 600 extra-territorial lines, whose mileage of wire would, perhaps, bring the total of telephone wire in use up to that employed for telegraphic purposes.

The concluding portion of this bulky volume is one that ought to be at the present time very interesting to telegraphers and all devoting attention to the subject of postal telegraphy. It gives a sketch of the history and nature of government telegraphs wherever they existed, and it appears that they were then to be found in Great Britain, Germany, France, Austria, Hungary, Russia, Switzerland, Belgium, Holland, Sweden, Norway, Denmark, Portugal, Roumania, Turkey, Brazil, Japan, Canada and New Zealand. Generally, the telegraph has been a government institution from the time of its establishment. We fail to see, from the figures, that the system is of any special benefit to the people, though it may be of great advantage to the respective governments. It does not look at all as though this country has suffered from the absence of a governmental control or monopoly of its telegaaphs. In 1880 Europe, with its 285 million people, as compared with our 50 millions, had only 759,672 miles of wire, while we had 291,213; and it had only 33,368 offices, while we had 12,510. The total number of messages sent in Europe was 87,149,355; here it was 31,703,181. Viewing these figures in the light of the fact that in Europe the volume of trade and commerce is so much larger than here, owing to the denser population and the long accumulation of wealth, it becomes plain that private enterprise has in no respect been beaten by official management. Analyzing the figures, we find that in almost every country mentioned the government is carrying on the business at a loss, so that the deficiency has to be met from the public purse, although the rates are relatively as high as they are here.

THE ELECTRIC LIGHT POLES TO STAY.

A month or two ago the New York papers teemed with articles on the subject of the danger of aerial electric light wires, and the attempt was made in some quarters to show that the objections to placing wires overhead were so grave as to demand an immediate cessation of the practice. The cause of all this commotion, which resulted in the city ordinance requiring that all wires used for electric light purposes should be put underground within two years from next May, was to be found in suits brought in the Supreme Court of the State. Mr. John O. Tuttle and others sought to obtain an injunction against the Brush Company, restraining it from placing poles and wires in Twenty-fifth street, and a judgment directing the removal of the poles and wires which were erected between Broadway and 8 xth avenue. At about the same time Mr. Henry N. Smith sought to obtain a permanent injunction against the United States Company, restraining it from keeping or erecting its poles in front of Mr. Smith's premises Nos. 4, 6, 8, 10, 12 West Forty-third street, where he proposed to erect a large apartment house. Around these neuclei grew up a mass of legend and myth as to the awful danger of the wires that might well astonish even those who devote their powers of investigation to the processes by which fables and fairy stories have been constructed. Moreover, at the hearing of these suits, the expert testimony given on both sides was extraordinarily voluminous, and we imagine that the conviction forced upon the mind of the public by it was that the evidence of some electrical experts is about as trustworthy as that of experts in any other profession.

Judge Ingraham, before whom the suits were argued, has now handed down his decision. In the first case he adjudicates in favor of the defendants, with costs; in the second, the motion for an injunction is denied, with $10 costs. He holds that the poles as erected and used in Forty-third street are not such a structure as is subversive of and repugnant to the use of the street as an open public street. In the course of an elaborate opinion, the views expressed in which cover the questions involved in both cases, he says:

"It cannot be seriously maintained that the structure here erected closes the streets to any appreciable extent, nor that such poles seriously affect the light or air of or the right of access to the plaintiff's property, but such use of the streets is entirely consonant with the use of a street as a street and is not such a structure as is 'subversive of and repugnant to the uses of the street as an open public street.' The Legislature has, as we have seen, given the city authorities power and authority to light the streets, and instead of doing it directly by the city, it has authorized and empowered them to contract for such lighting of the public lamps with gas or other illuminating materials in said city by one or more contracts. This power given was conferred for public purposes, and while it is to be exercised in conformity to the direction of the Legislature, yet within the discretion given by the Legislature as to the mode and manner of lighting the streets and the illuminating materials to be used for such purpose, the city authorities are the 'sole and exclusive judges.' The commissioner had given permission to erect the poles objected to, and it thus appearing that the city authorities, following the direction of the Legislature, have exercised the discretion vested in them, their action became conclusive, for if a person owning property on a street could object and prevent the carrying out of the contract, it would give such property owner the power which the Legislature has vested in the city authorities. The fact that the street through which the poles are located (Twenty-fifth street) is not one of the streets lighted is not material."

Thus, it would appear that unless the Legislature intervenes, the ordinance adopted by the city authorities stands good, and that those who are so suspiciously eager to see the wires put underground must possess their souls in patience a little longer.

A SYMBOL WANTED FOR DYNAMO.

Mr. J. Munro, writing to our English contemporary, the *Electrical Review*, calls attention to the unquestionable need that exists for a symbol to represent "dynamo." He says:

"A common graphic symbol for 'dynamo,' such as we have for 'battery,' would be a convenience. Might I suggest the figure $\overline{O}$ or $\underline{O}$ roughly representing the coil and brushes. The poles can be distinguished by making one dash or horn thicker than the other, as in the well-known battery symbol; thus $\underline{O}$ would mean a continuous current machine (the upper pole being +, the lower —), while $\overline{O}$ might stand for an alternating machine.

"The symbol can be made up in type by the letter 'O' and two dashes. It may also be represented by the letter 'D,' which it would be well if writers would agree to adopt for 'dynamo' in diagrams, etc., just as 'B' now stands for 'battery' and 'G' for 'galvanometer.'

"Of course $\overline{O}^{+}$ might stand for a continuous machine, the upper being the positive pole; but $\underline{O}$ assimilates more to the battery symbol."

The suggestion is good, and the general adoption of some such graphic symbol would, as our contemporary remarks, be advisable. As our contribution to the discussion, we would propose, however, that for a continuous-current machine the symbol used be $--O+$, and for an alternate-current machine $\pm O\mp$, using the algebraical signs plus or minus. This will admit of a uniform interpretation of the symbols here and in Europe. Mr. Munro may not be aware of the fact that at present confusion exists as to the meaning of the conventional thick and thin lines in a battery symbol, and that in this country the short, thick lines are usually intended to represent the zincs. In Europe the thin lines represent the zincs and the thick lines the other plates. The adoption of our plan therefore, would obviate confusion as to the sign of the poles, while it presents less typographical difficulty. By a simple addition our symbol for the continuous-current dynamo, as given above, could be made to show the peculiarity of winding the field magnets. Thus $-O'+$, using a "prime" as exponent would indicate "series-winding." The same character used as coefficient, or to the left, thus, $-'O+$, would designate a "shunt-wound" dynamo, while the use of both at once ($-'O'+$) would designate "compound-winding."

TELEGRAPHIC RIGHT OF WAY.

The question of telegraphic right of way has of late come under judicial consideration in various forms, and the result is that the decisions do not harmonize or agree. Three weeks ago we called attention to the decision of the Supreme Court of Massachusetts by which it was held that a telegraph company had the right to erect its line upon a public highway without paying compensation to the proprietors of the land on the road or street, such use being but a new way of exercising the old public easement, and of the nature for which the land was originally acquired.

In this week's issue we report a case in the same court, in which it appears that the Western Union Company had failed to secure permission, as provided by law, to exercise this right, and that therefore the plaintiff, an employé of the company, could not recover damages for injuries received by him, from a passing train, while in the performance of the illegal act of putting up the wires.

These two decisions go together well enough, but a third decision has been given in Illinois, by the Supreme Court of that State that conflicts seriously with them. The Board of Trade Telegraph Company was sued for trespass on the lands of a farmer in using the public road in front of his farm. The necessary permission had been given by the County Board enabling the company to use the road, and the gravamen of the action was that the defendant, with force and violence, had dug holes and put telegraph poles into them. In the lower court the plaintiff won his case, but the company appealed, and now the judgment has been confirmed in the Supreme Court by Judge Smith. It is decided that the proprietary rights of the plaintiff have been interfered with in a manner detrimental to his interests as owner of the fee. The action of the company in taking possession of the land forcibly, against the farmer's will, comes within the constitutional inhibition that "private property shall not be taken or damaged without just compensation." The court contradicts the Massachusetts court flatly in the following language: "The construction and maintenance of a telegraph line upon the highway is a new and additional burden upon the fee, to which

it was not contemplated it should be subjected, and for which the owner is entitled to additional compensation." The principle maintained is that neither the State nor a municipal body can grant away the private property of citizens in the manner stated; that corporations exercising their acquired right of eminent domain must make fair compensation, and that, aside from all considerations of right and justice, the Constitution has so declared.

Here, then, is a palpable conflict of opinion, adding in a striking manner to the glorious uncertainty of the law.

Electric Lamps and Regulators.*

BY DR. N. S. KEITH.

(*Continued from page* 61.)

Fig. 21 represents another method which has been tried with the object of avoiding the use of feeding mechanisms. Only an electro-magnet to effect separation of the carbons to form the arc was deemed necessary. The two positive carbons are represented at *b b*, and *c c* are the negative carbons. The several carbons are mounted in proper holders which are attached to rods running in guides, so that the tendencies are to move longitudinally toward a common centre. The negative rods and attached carbons are caused to move in the proper direction by cords, weights and pulleys, or by springs. The positive rods and attached carbons move by gravity or by like means to those employed for the others. One or the other set is mounted on the armature of an electro-magnet which draws the armature to separate the two sets when current is caused to flow in the circuit. A spring moves the armature back when current ceases to flow.

As the carbons of their respective sets burn away they progress toward the common centre where the arc is located, at such angles that they meet, and each acts to impede the further progress of the other of its set.

Fig. 22 is a diagram for the purpose of illustrating the principle upon which the so-called differential lamps are based. Let + *b d c* — represent the main, or light, circuit of an electric lamp, and the spire from *b* to *c* represent a derived circuit of high resistance joining the two binding-posts + and — of the lamp. Let us furthermore assume that the normal resistance of the light circuit when the light is burning is four ohms, and that the resistance of

FIG. 21.

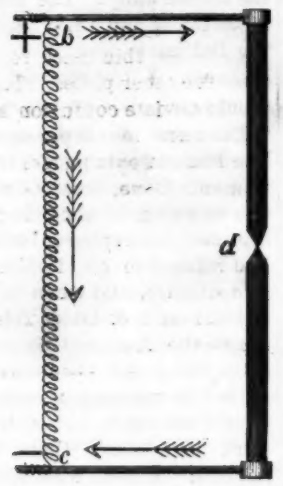


FIG. 22.

the derived circuit is four hundred ohms; then, according to the law governing the division of electric current between two circuits, approximately one per cent. of the total will flow in the derived circuit. This may be stated mathematically:—As 400 is to 4, so is 1 to .01. Or, if the current in the main or light circuit be 10 ampères, then the current in the derived circuit will be 0.1 ampère. The difference of potential, then, between + and — must be as $C \times R = E$; or 10 ampères multiplied by 4 ohms equals 40 volts. And as $\frac{E}{R} = C$, or $\frac{40 \text{ volts}}{400 \text{ ohms}} = 0.1$ ampère, one-tenth of an ampère of current flows in the derived circuit.

Now, in practice, the ampères of current in an electric light circuit are kept as nearly uniform as possible; so, for sake of illustration, we will assume that change in that respect does not take place; but as the resistance of a light-circuit of a lamp is constantly changing, owing to the changes which take place at the arc, the difference of potential between + and — must also constantly change. To illustrate: Before the arc has been formed we may assume that the resistance between + and — through the carbons is 0.5 ohm, then the difference of potential is as here stated: 10 ampères multiplied by 0.5 ohm equal 5 volts potential. With this small potential but a small quantity of current will flow in the derived circuit: $\frac{5 \text{ volts}}{400 \text{ ohms}}$ equals 0.0125 ampères, which is only one-eighth of the current which flows therein under the normally relative resistances of the two circuits.

Let us consider an opposite extreme. If the lamp does not feed, but lets the arc increase in length until the resistance of the light circuit has become five ohms, then the difference of potential between + and — will be 10 ampères multiplied by 5 ohms, which equals 50 volts. Then there will flow in the derived circuit a current equal to $\frac{50 \text{ volts}}{400 \text{ ohms}}$ which equals 0.125 ampères, or 25 per centum more than the current in the same circuit under the normal conditions.

Now it will be seen that if the circuit of high resistance has an electro-magnet in it which operates mechanism to control the feed of the carbons to compensate for combustion, the lamp so constituted will operate by reason of changes of resistance in its individual portion of the total circuit, and not as in the lamps we have been considering, by the changes in the strength of the main electric current brought about by changes in resistance. The values I have given in way of illustration are approximate ones. In reality the current is divided between circuits in a slightly different proportion, because the two circuits are somewhat more inter dependent than I have stated; but my statement is sufficiently exact for illustration or practice.

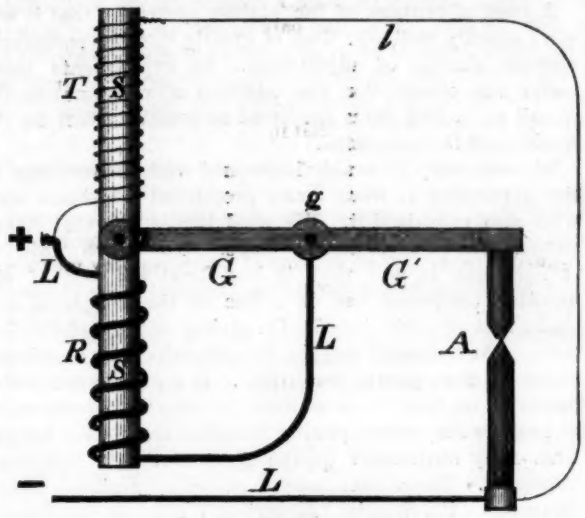


FIG. 23.

This principle of regulation may be applied to some or many of the lamps which I have described, with the effect of making them capable of running in series upon one circuit. How it may be so added will be seen from the lamps which I shall proceed to describe after stating that the Lacassagne & Thiers and the Tchikoleff lamps, which were illustrated in Figs. 13 and 14, depend upon this principle.

Fig. 23 is a copy of the diagram that is ordinarily used to illustrate the principle of differential lamps of the Von Hefner Alteneck type. This is usually called the Siemens lamp, but was invented by Von Hefner Alteneck, who is employed as electrician by the firm of Siemens & Halske in Berlin.

S S is a cylindrical iron core which is freely movable vertically within the tubular space of the two solenoidal coils *T* and *R*. *G G'* is a lever pivoted at *g* and attached at one end to the core *S S*, and at the other end to one of the carbons. *L L L* represent the main, or light circuit, which includes the carbons and the arc *A*, and *l* represents the derived circuit of high resistance. The lever *G G'* represents the mechanism of the lamp, which mechanism may be clock-work, clamp or other devices for engagement with the rod which carries the positive carbon. In the Siemens lamp, clock-work actuated by the weight of the positive carbon rod is used. Electric current enters at +, and there divides. The major part goes to the arc by the low-resistance circuit *L L L*, taking in the coils *R*, and out at —; and the minor part traverses the coils *T* and the circuit *l* without entering the arc.

At commencement of flow of current most of it takes the course through the coils of solenoid *R*, and a scarcely appreciable amount through the coils of solenoid *T*, after the manner and for the reasons which I have just described. For this reason the solenoid *R* becomes strongly magnetic and attracts the core *S* downward. This movement depresses the core end of the lever, and raises the carbon end and its attached carbon to separate that from the under carbon to form the arc. Immediately the current in *T* is increased by the rise of difference of potential between + and — due to the increase of resistance in the light circuit, and if this increase of current and consequent rise of magnetic attraction in *T* were not compensated, the core would be pulled upward to extinguish the arc. But an adjustable spring is placed at some convenient place, so that it may be made to balance any part of the attractive force of *T*. When the current and magnetism in *T* have grown enough to raise the clock-work, represented by the lever *G G'*, away from engagement with a detent so that the wheels may rotate, the carbon moves downward until the normal arc, potential and current in *T* are restored, and the attractive force of *R* pulls the clock-work wheels into re-engagement with the detent to stop the feed movement. These movements are repeated as often as necessary, and all automatically.

Such a lamp is called "differential," because it is operative by reason of the difference between the magnetic attractive forces of the two opposed solenoids.

Another type of lamp called differential is shown by Fig. 24. This represents the lamp made by the Brush Electric Co., of Cleveland, Ohio, and is the invention of Mr. Charles F. Brush of that place. This lamp is based upon the fact that two electric currents flowing in parallel but in opposite directions neutralize each other and therefore decrease their magnetic influences. *A* represents a spool upon which two circuit wires are wound. One is of low resistance and is in the light circuit and the other is long, fine, of high resistance, and runs from + to — around the arc. The two are wound in opposite directions; or, what amounts to the same thing, the parts of the current are caused to flow in their respective circuits in opposite directions. *B* is a tubular iron core to the double solenoid just described. This core is balanced by adjustable springs. *C* is a tube of brass which is freely movable, vertically, within the core. *D* is a hook attached to the core, and *E* is an annular clamp, shaped something like a washer, which is caused to engage with the tube *C* by the upward movement of the core and the hook *D*. *F* is a fixed stop upon which the washer rests when at its lowest position. *M M M* represent the main, or light, circuit, and *S* the derived circuit. The magnetic influence of a solenoid upon its core may be represented by the formula $C \times T = M$, in which *C* stands for the current flowing in the wire, *T* stands for the number of convolutions of wire in the solenoid, and *M* stands for the effective magnetism.

It will be seen that any given value of *M* may be attained by proportioning either one of the factors *C* and *T* to the stated value of the other. For example, let the following tab'e represent assumed conditions of the two solenoidal circuits:

	Current.		Convolutions.		Magnetism.
Main circuit.....	10	×	100	=	1000
Derived circuit.....	0.1	×	10,000	=	1000

It is, therefore, evident that any relative value can be given to the magnetic difference between the two circuits, and that while the magnetic capacity of the main circuit

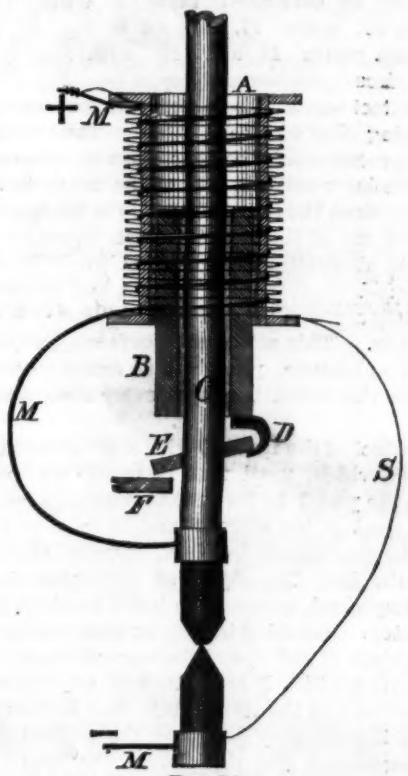


FIG. 24.

is, under the conditions of practice, unaltering, that of the derived circuit is continually rising or falling.

When current is started, the main solenoid asserts itself and raises the core, hook, clamp, tube and carbon to form the arc. But when the arc has become too long the derived circuit current so neutralizes the magnetic influence of the main current that the core, hook, clamp, tube and carbon move downward until the clamp rests upon *F*. This rest causes the release of the grip of the clamp so that the tube slips downward slightly through the clamp in effecting the feed.

(TO BE CONTINUED.)

Lighting Railroad Cars.

Direct electric lighting of one of the trains of the District Railway between Kensington and Putney is stated to be very successful. The light is not only superior to that obtained from oil or gas, but it is reported to cost only two-thirds that of the latter. The Cheesewright primary battery has been tried on the Southeastern Railway. A saloon carriage was fitted with incandescent lamps, the current being supplied by cells placed in the guard's van. The light is said to have been very steady on the journey from Charing Cross to Dover. Successful experiments with the electric light for railway trains have been made on the Chemin de Fer d'Orléans. The accumulators were fed by dynamo machines, but the lamps were only supplied by accumulators, the latter being charged at the same time as the lamps were fed by them. Faure accumulators, in sufficient numbers to secure the lighting during twenty four or thirty hours, were placed under the seats, and each compartment was lighted by two incandescent lamps of 10 to 12 candle power.

* Lecture delivered before the New York Electrical Society, Jan. 16, 1884.

(*Continued from page 75.*)

which a circuit of six bells *C C*, etc., is connected. It is evident that the same outfit may be used for signalling on all the circuits connecting with the same switchboard. The outfit may in fact be used for working as many circuits of from two to twelve stations each, as the operator can manage.

Fig. 2 shows a plan of the calling instrument (Fig. 1, *b*), the generator (Fig. 3) being placed near it for convenience in following the connections. Fig. 4 is a section reduced, showing a side elevation of the call key **C** and its connections. Fig. 5 is a section of the calling instrument through the centre from **6** to **U**. The mechanism by which the index-hand *L* is moved is as in Fig. 1, the double pawl *D D*, motor magnets *A A'*, and polarized armature *B* being shown in dotted lines. The office of the escapement arms *E E* is to check further motion of the index from momentum, after each pawl movement is completed. The armature of the magnet *R* (Fig. 5) is provided with a detent *Q*, whose function is identical with that in the station instrument. Outside the dial and concentric therewith are two metallic rings, one within the other, and screwed to a rubber base plate. In Fig. 5 these rings are seen in section, *H* being the inner one to which are pivoted the key-levers *G*, normally prevented by the springs *I* from making contact with the outer ring, *J*. This contact occurs when any one of the buttons is depressed. The connections of the generator and the calling instrument are as follows:

Brush *W* is normally connected with the line post *Y*, the circuit first going through wires 1 and 2, resistance coil, wire 3, post 4, switch-spring *N*, wire 5, motor magnet *A'*, wire 6, motor magnet *A*, wire 7 to frame of instrument, wire 8, detent magnets *R, R*, and wires 10 and 11. The ground side of the generator is connected with ground post *Y*, the circuit being completed through brush *X*, wires 12 and 13 to ring *J*, where there is a normal break, which is bridged by the depression of any one of the series of keys *G*, completing the circuit through ring *H* and wire 14. Brush *U* is connected through wires 15 and 16 with contact screw 17, (shown in Fig. 4), and brush *V* through wires 18 and 19 with spring *O*. Both of these circuits are normally open (see Fig. 4) the spring *O* and contact screw 17 being beneath, but not in contact with, spring *N* or with each other. Thus it will be seen that the generator may be kept running constantly without producing a current, unless the break in its ground circuit (between the rings *H* and *J*) be bridged by the depression of one of the keys *G*, which depression closes on the line an alternating current from brush *W* that causes the polarized armature *B* to vibrate and move the index *L* until it is arrested by the spring extension *K* of the depressed key. This alternating current, passing over the line, has, of course, produced an exactly corresponding motion in the index hands at every station on the same circuit.

The contact of the index *L* with *K* gives the current from brush *W*, which, until that moment, was passing out through the post *Y* to the distant stations, a short circuit through the key and wires 13 and 12 back to the ground side of the generator at brush *X*, thereby effectually cutting out the line. The object of this short circuit is, as already explained, to cause the index hands at all the stations to stop. Releasing the key restores the normal break between rings *H* and *J*, and the current ceases, leaving the index in the position it had attained when arrested. In order now to ring the station bell that is thus placed in circuit, it is neccessary to depress the call button **C** to send the strong current into the circuit. By this button the lever *M* is depressed, which causes spring *N* to break contact with post 4, thus opening the motor circuit on the line side of the generator and afterward to make contact with spring *O* and contact screw 17, delivering to the line the double current from brushes *U, V*. The spring extension *c* of the call key (also shown in elevation in Fig. 4) makes contact with post *d* immediately after the break between spring *N* and post 4, thus closing the break in the ground circuit through wires 22 and 14 in the same manner that it is closed by the keys *G*. This current being of greater strength than the alternating motor current, and delivered direct from the generator to the switch-spring *N* without passing through the resistance coil is sufficient to ring the bell then in circuit.

The subscriber having been signalled the telephonic connections are made in the usual way. As soon as the subscriber "rings off," or the operator ascertains by inquiry that the line is no longer in use, the instruments are all brought to unison. It is for this purpose that the key marked **U** (Fig. 1, *b*) is reserved.

This key has no spring extension *K*, and when depressed the index moves until it reaches the detent *Q*, which arrests it; but as the detent has no connection with the ground ring *H*, the current continues to pass over the line. If the station instruments are all properly working all the index hands will reach the "unison stop" at the same time that the index in the calling instrument reaches the detent *Q*; but if any of them have lagged behind the continuance of the current will bring them to this point. As the detent magnets of the calling instrument are in the line circuit they are excited by the motor currents, but the spring *y* (Fig. 5), of the detent armature *Z* has tension sufficient to resist their attraction, and the detent remains in the path of the index. In order to release the index the "reinforce" current is brought into use by depressing the call key **C**, and the detent Q is thus moved by the armature *Z* from the path of the index. The index does not however, move from its position, because, as before stated, the reinforce current is not an alternating one, and cannot therefore actuate the polarized armature *B*.

The use of the button marked "*IND*" (indicator) is for cases when two subscribers on the same circuit are to be connected together. As only one station is in circuit at a time when the index hands occupy any other position except that of unison, the connection between two subscribers on the same circuit can therefore be effected only in this position of the index hands. In such cases the key *IND* is depressed, by which the indexes are all moved forward one point, thereby indicating that the line is in use. The unison shunts are made of greater length than the bell shunts for this purpose, in order that the index hands may still remain in contact with them after having moved to this point.

The time required for signaling a subscriber is very brief, as we can testify from experiments we made at Cincinnati, on the line exhibited at the telephone convention. The signal can be easily made within two seconds.

A great advantage of the Stabler system is, that it will work equally well over lines of greatly varying resistances without change of adjustment. In experiments made under our observation the addition of resistance to the circuit up to 2000 ohms produced no sensible effect on the working of the apparatus.

We were very favorably impressed with the working of the apparatus, as were many prominent telephone men who also examined it. We need hardly say that it has passed the experimental stage. To prove this, it is sufficient to say that it has stood the test of six months continuous use on a line of the Telephone Exchange at Washington, D. C., giving entire satisfaction both to the company and the five subscribers on the circuit under all atmospheric conditions. It is now in successful operation on lines of a number of telephone companies, and others are contemplating its adoption, its use having been fully authorized by the American Bell Telephone Company. The Stabler individual call apparatus is manufactured by the Standard Electrical Works of Cincinnati, Ohio, for the Stabler Signal Company, of Washington, D. C., which controls the numerous patents by which it is covered. ***

Illegal Running of Western Union Wires.

Several legal decisions have been given lately on questions affecting the telegraphic interests of the country. One of the latest is that handed down by the Supreme Court of Massachusetts, holding that the action, brought by Edward S. Banks against the Highland Street Railway to recover for personal injuries, could not be maintained. The plaintiff, at the time of the injury, was in the employ of the Western Union Telegraph Company, and was engaged in constructing lines of telegraph along the line of the Boston & Albany Railroad and over Columbus avenue. He was carrying the end of a wire up a pole on the easterly side of the avenue, when one of the defendants' cars caught the wire, and the plaintiff was pulled from the pole and injured. The Supreme Court has now set aside the verdict rendered for the plaintiff in the Superior court. In the opinion, by Judge Colburn, the court says:

It was not the purpose of the Revised Statutes of the United States, section 5263, to deprive the States of the right to regulate, to a reasonable extent, the manner in which the lines of telegraph shall be constructed over and along post roads of the United States. There is no conflict between General Statutes, chapter 64; Public Statutes, chapter 169, and the statute of the United States. General Statutes, chapter 64, section 2, provide that incorporated telegraph companies may, under the provisions of the following section, construct lines of electric telegraph upon and along the highways and public roads, and the third section provides that the mayor and aldermen shall give the company a writing, specifying, among other things, the height at which, and the places where the wires may be put. This writing is to be recorded in the records of the city. As the telegraph company has no such writing, it has no right to run its wires across Columbus avenue, as the plaintiff was doing at the time of his injury. The wire which looped across the street, so that it might be hit by passing carriages, was, at least, a nuisance. The plaintiff was carrying the wire looped across the street, attached to his person, and with his back to the street, so that, if the wire was struck, he would be pulled from the pole he was climbing. He was not only doing an unlawful act, but was doing it in a manner peculiary dangerous to himself. What he was doing was a directly contributing cause of his injury. The car was lawfully passing upon the street, and could not continue its course without striking the wire. The driver of the car, when he saw the wire, had no right to drive on without care or concern for the consequences, but the defendant was not liable to the plaintiff for mere error of judgment on the part of the driver. The jury should have been instructed that the plaintiff's illegal act contributed to his injury, and that he was not entitled to recover unless he satisfied them that the driver of the car recklessly and wantonly drove against the wire. The defendant's exceptions were accordingly sustained.

Two Companies Fighting for an Office.

A struggle between the Western Union and Baltimore & Ohio Telegraph companies, at Philadelphia, for the possession of the branch office in Howell Brothers' banking house, has caused much excitement in that city during the current week. It appears that some time ago the Howell Brothers were good enough to allow the Western Union company to have an office on their floor, South Third street. Lately, however, the firm desired to make a change and to give the space to the Baltimore & Ohio Company, who are willing to pay rent. They notified the Western Union company to that effect, but the officers of that company refused to move out, claiming a right of possession. Thereupon the firm set to work to starve out the garrison maintained by the company, but it was not until the 3d inst. that they accomplished their aim of giving possession to the Baltimore & Ohio people. About 1 o'clock Messrs. Howell Brothers, accompanied by a constable armed with a warrant, and followed by Assistant Superintendent Jones and a small army of Baltimore & Ohio workmen, arrived at the Howell Brothers' office. The fast-barred door was opened to them and they filed into the office. The constable went up to the corner inclosure, peered through the little window at operator Conn, who was standing within, and informed him that he had a warrant for his arrest on the charge of trespass. Conn, after looking at the warrant, objected, stating that there was a mistake in his initials, and refused to come out. He sat down and began clicking news to the main office to the effect that the enemy had arrived and were storming the castle.

"Pull the whole business down," said some one. The Baltimore and Ohio men stepped in to the work, and, grasping the walnut structure by its top, they fairly tore it to pieces, the glass cracking into fragments, the table, instruments, batteries, clock, pens, ink, blanks, and a hundred and one other things, including a bottle, one-quarter full of whisky, coming to the floor with a crash, and leaving the startled operator standing unprotected and alone. In an instant the constable had stepped over the wreckage and captured the operator, and marched him to Magistrate Lennon's office. All the Western Union property at No. 48 South Third street was carried into the street and a Baltimore and Ohio lineman dropped his wires down through a hole in the corner of the ceiling from the second story. The connections were promptly made, a Baltimore and Ohio sign was hung outside, and by 1:15 the Baltimore and Ohio was established and ready for business. Large crowds, in the hope of further trouble, hung about the place until the close of business hours.

The result of all this is legal proceedings on both sides. The Philadelphia papers report as follows: The news that Common Councilman Charles L. Howell had been arrested this morning for throwing the Western Union Telegraph Company's paraphernalia out of his office after the company had refused to go, despite fully two weeks' notice, flew like wildfire, and when he, together with Thomas J. Fahy, a Baltimore & Ohio Telegraph operator, and Wm. G. Jones, the Assistant Superintendent of the Baltimore & Ohio Telegraph Company, walked into Magistrate List's office this morning in company with a constable who had visited the office, 48 South Third street, and read the warrant, he found there several politicians from the Seventh Ward, who had come to be of any service to him that they could. Mr. Howell assured these gentlemen that he required nothing. He was represented by his counsel, Mr. James H. Heverin, who read the affidavit, in which William B. Gill, the district superintendent of the Western Union Telegraph Co., charged Mr. Howell, Mr. Fahy and Mr. Jones with having forcibly entered the company's premises and maliciously destroyed its property. At the request of the Western Union officers a hearing in the case was fixed for to-morrow afternoon at half-past three, and the accused were each held in $1,000 bail to appear at that time, John E. Zeublin, General Manager of the Baltimore & Ohio, entering security for their appearance.

Action on the other side is reported as follows by telegraph:

"The case of Wm. H. Conn, George Ryley and Andrew P. Bell, employés of Western Union Telegraph Co., charged with conspiracy and forcible entry and detainer, in holding possession of the office in South Third street, came before Magistrate Lennon this P. M., but in consequence of absence of witnesses the hearing was adjourned until next Thursday afternoon."

THE SNOW-STORM.—Considerable damage was done in the Eastern and Atlantic States by the sudden and heavy snow storm of the 27th and 28th Feb. Boston suffered very much, and the Mayor requested the electric light companies to refrain from lighting their lamps during the night because of the falling across their wires of the telegraph and telephone wires. It is said that of the 1,600 wires connected with the New England telephone office only about one-third were in working order. Reports of damage came in also from New Haven, Poughkeepsie, Westchester County, this State, Halifax, N. S., and St. John, N. B.

THE TELEGRAPH.

NICARAGUA AND COSTA RICA.—The governments of Nicaragua and Costa Rica have made satisfactory arrangements for the payment of Costa Rican cablegrams via Nicaragua. They have also arranged for the better maintenance of the Costa Rican land lines.

GEO. F. TRUELL, for the past three years so prominently identified with district messenger service in this city, has accepted an important position in the American District Company and entered upon his duties. His experience in the business of rival companies renders his services of particular advantage to this company.

A SUIT AGAINST THE WESTERN UNION.—At Pittsburgh, on March 1, William H. Johnson entered a suit against the Western Union Telegraph Company to recover $20,000 damages for injuries sustained by being knocked off a car by the defendant's wires while in pursuit of his duties as a brakeman on the Pitts burgh & Western Railroad.

MR. WM. M. MALLETT, manager of the W. U. office at Syracuse, N. Y., for many years, has taken the position of Superintendent of the Bell Telephone Co. of Buffalo, N. Y., with headquarters at Rochester. The change dates from March 10. Mr. J. E. Bierhardt, night chief operator up to March 1, takes the position vacated by Mr. Mallett.

"IT IS ALL BOSH."—A dispatch from London on Tuesday said that the other cable stocks were advancing on reports of a disagreement among the projectors of the Mackay-Bennett cable. "It is all bosh," said Mr. J. W. Mackay. "There is no disagreement or trouble whatever, and the project is being carried out as planned. The details have all been published."

WHAT A LINE COSTS.—At Washington, on Feb. 27, the subcommittee of the Senate Committee on Post-offices examined Collin Fox, an experienced telegraph line builder from the Western Union Company. He said it bad never cost the Western Union more than $75 a mile to build a single wire line with cedar poles, or more than $105 a mile for a two-wire line.

A BROOKLYN COMPANY.—The People's District Telegraph Company has filed articles of incorporation in the Kings County Clerk's office in Brooklyn. The incorporators are Richard J. Bromley, John W. Newberry, Leonard Blend, Henry C. Buckman and James McDermott. The company is to have its headquarters in Brooklyn. The capital stock is $60,000, divided into 6,000 shares.

AN INTERNATIONAL TELEGRAPH UNION.—The Associated Chambers of Commerce, of England, adopted a resolution on Feb. 21 in favor of the formation of an international telegraph union which should transmit messages at a low fixed rate. Postmaster General Fawcett will be requested to submit suggestions looking to the accomplishment of this at the approaching Telegraph Conference.

A STRIKE OF TELEGRAPHERS.—The *Commercial Gazette* of Pittsburgh, Pa., stated on March 2 that 24 operators had struck at the Galveston (Tex.) W. U. office for extra pay, only two men remaining at work. Up to the present time little has been learned about the strike. It is said that the real grievance of the men was connected with the question of extra work, and that only about half a dozen of them are "out."

BROWNLEE & Co., of Detroit, Mich., intend to be able about the middle of April to supply brackets, pins and crossarms in large quantities. They have their own timber land on Grand Lake, Mich., but will not wait till they can utilize that, having bought meantime 350,000 feet of pine lumber. They ship oak timber to Europe, and will take the butts and make pins of them, as they are the toughest part of the timber. The pins will all be made of straight-grained tough oak.

THE FALL OF A BIG POLE.—A sixty-foot telegraph pole, containing forty wires, fell across the Boston and Albany Railroad track, near the Columbus avenue station, Boston, on the 28th of Feb., delaying travel for over an hour. A passenger train had just passed, and the last car was not more than twelve feet from the pole when it fell. The accident was due to the accumulation of snow on the wires, although the pole showed that it had been set in the ground only four and one-half feet.

THE SEABOARD LINE.—It is stated that the Philadelphia & Seaboard Telegraph Company, organized by Mr. G. B. Pennock, particulars of which we gave on Feb. 23, is debarred by its charter from consolidating or selling out to any corporation, assignee or person. The intention of the company is to sell territorial rights to sub-companies. The composition of the subaqueous cable is the invention of Mr. Milton Cowperthwait, of Riverton, N. J. Mr. Pennock's duplex and quadruplex instruments will be used by the company.

WATER FOR JAY GOULD.—The reservoir which supplies the village of Tarrytown with water, and which has a capacity of several million gallons, was recently found to be dry. An examination disclosed the fact that the foreman on Jay Gould's estate had turned the water into Mr. Gould's domain, though it was not clearly demonstrated whether it was for the purpose of watering some more stock, or, as the foreman said, to fill several ponds on the estate. The bill for Mr. Gould was $237, and although it is more than he ever paid for "water" before, it was promptly liquidated.

THE TELEPHONE.

LOSS BY THE STORM.—Speaking of the effect of the late snow storm in Boston the *Herald* says of the New England Company: The estimated loss by the storm is $10,000, including interruption of business. It will probably have no effect on dividends.

PEOPLE'S CO. SHARES IN DEMAND.—The Boston *Herald* of March 2 says: People's (parent) telephone shares are in demand, and reported scarce at 10. The demand is, however, thought to be speculative. The company reports to the New York State authorities at Albany that it has no earnings and its stock has no value, meaning, of course, upon the basis on which reports are made. For speculative purposes its value is, of course, the market price.

A SMALL CONSOLIDATION.—The New York & Pennsylvania Telegraph and Telephone Company, a corporation which controls the telephone interests in four counties in Pennsylvania, and has recently purchased the Erie, Pa., Exchange, will, it is said, shortly begin the erection of a line to Ashtabula to connect with the Cleveland Telephone Company's line. When this connection is made Cleveland will have telephonic communication with Erie, Meadville, Titusville and other points in that region.

THE NEW ENGLAND EARNING SIX PER CENT.—The New England Telephone Company on the 1st of December, 1883, had 16,771 subscribers. During that month it added 230, making its total number of subscribers 17,001. In January it added 458 more, bringing the aggregate up to 17,459, and this month it will do equally as well. The extra-territorial business for December amounted to 25,600 messages, and for January to 36,000. The company at the present time is said to be earning at the rate of 6 per cent. on its $6,000,000 of issued capital stock.

BUSY IN AND OUT OF SEASON.—We learn that the business of the Union Telegraph and Telephone Company, whose territory includes Washington, Warren and Saratoga counties in this State, is growing rapidly under the able management of Supt. Harry T. Downs, brother of General Manager Loren M. Downs, of the Lowell Syndicate. Although Saratoga is now on "a peace footing," the number of new subscribers connected with the exchange since last October is greater than the number of telephones disconnected at the end of "the season." It takes energy to drum up new business in a hibernating fashionable summer resort.

THE ERIE CO.'S GROWTH.—Messrs. A. G. Pollard and H. B. Shattuck, who were appointed to audit the Erie Telephone Company's report for the quarter ending December 31, 1883, have just completed their examination of the accounts, and report that the company earned $68,000 net during the quarter, and that after paying the quarterly dividend (amounting to $48,000), $20,000 was carried to the surplus account, making the aggregate surplus $50,000. During the months of October, November and December there was an increase of 820 subscribers, and the total number on January 1 was 8,033. During the month of January about 300 more were added. The extra-territorial business for the quarter amounted to 15,000 messages per month, or at the rate of $4,000, or $12,000 for the three months. The surplus in the treasury is now being used largely for construction purposes.

UNDERGROUND WIRES TRIED IN BOSTON.—With reference to the local trial of underground telephone wires the Boston *Advertiser* says: "The telephone companies have also made repeated experiments with underground wires, and at present the New England Telephone Company have about a dozen underground cables running from their office in Pearl street in different directions, each about an eighth of a mile in length. These very imperfectly serve the purposes intended. The wires running through these underground cables give poor service compared with those above ground. In the case of the telephone wire the difficulty is caused principally by induction and leakage, the effect of which can be seen when it is known that better telephone service can be had between this city and Providence than between here and East Boston, as in the former case all the line in use is above ground, while in the latter the wire has to go under water in a cable for a small portion of the distance. At present four new inventions are being tested by the telephone company referred to. As soon as any system commends itself it is at once given a trial. The Western Union Telegraph Company have made but few such trials with any of their lines running out of Boston, as nothing has yet been devised that, as they think, promises to be of service."

THE ELECTRIC LIGHT.

SEDALIA, MO.—A stock company has just been formed at Sedalia, Mo., to put in an electric light plant at that place.

THE IDE ENGINE.—A 60-horse-power engine has been ordered from Mr. A. L. Ide, Springfield, Ill., by the Merchants' Electric Light & Power Co., of Danville, Ill.

TWO HUNDRED AND FIFTY FEET HIGH.—The government electric light at Hallett's Point, Hell Gate, is almost completed. The immense framework, 250 feet high, is finished and the national ensign was displayed from the staff this week. The machinery for lighting has not yet been put in place, but it is expected that it will be ready within the next few weeks.

ELECTRIC LIGHT TOWERS.—It is stated that the Elgin Electric Light Company has placed over ninety of its towers in different Western and Southern cities. It has also shipped some of the towers to South America, and, at the request of the governments of those countries has lately submitted estimates for the lighting of some of the principal cities of China and Japan by their system.

THE CUMMER ENGINE.—Among recent orders for the Cummer Engine was one from D. M. McGilman, a large dry-goods merchant, Cleveland, O., for an electric light installation. The engine is 10×20, of 55 horse power. The Brush Swan Electric Light Co., of New York, has ordered one 11×20, 55 h. p., and the Underground Electric Light Co., Philadelphia, two engines 16x30 of 170 h. p. each.

JOLIET, ILL.—The Fuller Electric Light Co. has purchased a lot, 33 × 165, at Joliet, Ill., and is erecting a fine building 30 × 72, about 20 feet high, for a central light station, with a capacity of 165 lights. The plant will consist of three 55-light dynamos and two 50 h. p. Payne engines. The lines will run on poles all through the city. Mr. S. S. Badger, the general Western agent of the company, is doing this on his personal account.

THE STRAIGHT LINE ENGINE COMPANY of Syracuse, N. Y., have lately furnished two of their Straight Line Engines, each 55 h. p., to the Savannah Electric Light Co.; one of 55 h. p., to the Utica Electric Light Co.; one of 35 h. p., to the Imperial Electric Light Co., New York; and the private plant of the Sweet Manufacturing Co., Syracuse, for running their Edison installation of 25 lamps and their Brush of 16 lamps, comprises one 20 h. p. engine.

REBUILDING A REFINERY BY ELECTRIC LIGHT.—The part of the St. Lawrence sugar refinery which was lately burned down, says the Montreal *Daily Witness*, is being quickly rebuilt. The work was commenced three weeks ago, and is now going on at night by the electric light from a Phœnix Electric Light Company's machine. The woodwork of the roofing is expected to be finished this week, as also all the bricklaying. There are two hundred and fifty hands employed.

LOWER GAS RATES IN CHICAGO.—The price of gas in Chicago was $2.75 per 1,000 feet with 50 cents discount to prompt payers. It is now $1.25 with 25 cents discount. This reduction, though it is of course very welcome to the citizens, interferes with the more general use of the electric light, patronage of which is also seriously held in check by the ordinance requiring wires to be carried under ground. At the present time the Fuller Company has, we understand, the only central station in Chicago.

THE VAN DEPOELE CO. IN THE WEST.—The installation of the Van Depoele system for Joliet, Ill., is about ready; the lights number 60. Sioux Falls will have an installation of 40 lights in a month. The installation at Winona, Minn., is 20 double lamps and three of 6,000 candle power; at Burlington, Ia., 40 lights; Streator, Ill., 70; Lansing, Mich., 40; Cronx, Minn., 30. Mr. G. L. Woodruff, at Rockford, Ill., and Mr. Geo. Stewart, Burlington, Ia., have been working most actively and successfully as local managers.

THE MCTIGHE CO. AT PITTSBURGH, PA.—We learn that the McTighe Electric Light & Mfg. Co., of 33, 34 and 35 Water street, Pittsburgh, will move in April to more commodious quarters, corner of Wood street and First avenue. They will occupy the entire building, 40×80, four floors. Mr. H. J. Schneider, who has charge of the manufacturing department, is an experienced practical electrician. The President of the company is Mr. E. M. Ferguson, Mr. T. J. McTighe is the Secretary, and and Mr. J. T. McConnell Superintendent. It is claimed for the McTighe system of arc lighting that with economy of power and simplicity of apparatus it furnishes a very steady pure white light. The Company say that their machines are also well adapted for incandescent lighting. They are now prepared to give estimates on plants required.

MISCELLANEOUS NOTES.

"THE ORIGIN AND DEVELOPMENT OF ELECTRICAL SCIENCE."—Mr. F. N. Gisborne, F. R. S. C., the able and energetic Superintendent of Government Telegraphs and Signal Service of the Dominion of Canada, delivered a very interesting lecture on the above subject, at Ottawa, under the auspices of the Literary and Scientific Society, Feb. 21. Not the least important part of the lecture was that describing the introduction of the electric telegraph into Canada in 1846, when Mr. Gisborne, as an employé of the Montreal Telegraph Company, opened the first office in Quebec. The lecture was illustrated with colored diagrams and evoked frequent applause. Mr. Gisborne spoke without notes, but made a most comprehensive survey of the whole field of modern electrical application.

ON BOARD THE "ATALANTA."—A despatch from Charleston, of March 3, announces that Mr. Gould has at last started on his long promised vacation, in the "Atalanta." It says: "On account of the brisk westerly winds which have prevailed for several days and the rough water out at sea Jay Gould could not get away from Charleston until to-day. He sailed at 11 o'clock this morning and crossed the bar at 12, with smooth water and fair weather, the wind blowing from the southeast. If the weather continues fair he intends to sail straight to Key West. Under other conditions he will proceed to St. Augustine, Fla. While here Mr. Gould spent most of his time with his family on his yacht. He came over to the city several times and received and sent a number of dispatches to New York, but talked to few persons. The pilot who took the Atalanta across the bar says that Gould was in high spirits and apparently bent on having a good time."

THE DEATH OF DR. MAURICE VERGNES.—Dr. Maurice Vergnes, inventor and electrician, died on March 2 at No. 64 Clinton place, this city, after a short illness. He was born in Besançon, France, in 1800, his father being at the time one of the Generals of Napoleon I. He graduated from l'Ecole Polytechnique, in Paris, and subsequently was appointed inspector of public works and of theatres. In 1830 he left Paris, and gradually drifted around the world. Some years later he settled in St. Louis, and was known there as an architect of ability. He also published a scientific paper in that city, in copartnership with Cortambère, the scientist. He subsequently came to this city, where he pursued the occupation of an inventor with much success. He obtained numerous patents for electrical and mechanical apparatus. At the time of the Crystal Palace exhibition in this city he displayed an electrical machine of his invention which attracted much attention. Of late years he has patented several devices in connection with steamship machinery. His death was due to the exhaustion of old age.

STOCK QUOTATIONS.

Telegraph, telephone and electric light stocks were quoted as follows on Thursday at the Electric Manufacturing and Miscellaneous Stock Exchange, and at the Stock Exchange:

TELEGRAPH.—Am. Cable, b 58, a 59½; Am. R., b 50, a 65; B. & M. Co., a 124½; Commercial Telegram Co., a 80; Mexican, b 125, a 147: Mut. Union, b 15½, a 16; Postal Telegraph (stock), b 7, a 8; Western Union, b 74¾, a 75.

TELEPHONE.—American Bell, b 165; American Speaking, b 110, a 125; Currier Telephone Bell, b 3; Colombia and Panama, b 19.87, a 20; Continental, b 12; Dolbear, b 5, a 10; Erie, b 33; Globe, b 9, a 11; Hudson River, b 80, a 90; Inter-Continental, b 75; Mexican, b 2.50, a 2.75; Mexican Central, a 3; Molecular, New England, b 39, a 39.50; New York, a 85; New York and New Jersey, a 80; New York and Pennsylvania, b 50, a 78; Overland, b 8, a 20; People's, b 10.50, a 11.50; Peoples (N. E.), b 1.50; Shaw, b 10; Solenoid, a 125; Southern Bell, b 95, a 125; Southern New England, a 175; Tropical, b 1.50, a 2; West India Telegraph and Telephone, b 1.90, a 2.

The Boston *Advertiser* of the 6th says of the local market: Bell Telephone declined 2½ to 165; Erie 1¾ to 33¾; New England advanced 1¼ to 36⅜; Mexican Telephone sold at 2½.

The Boston *Herald* of the 5th says: New England telephone is off again to 35½, too much stock offering, it is said, from the treasuries of the original companies, which are settling accounts.

A corner on People's telephone stock was rumored to-day, with 1½ per cent. asked for use in New York. The stock was 10¼ bid, ⅛ asked here and very scarce. No cause is assigned.

ELECTRIC LIGHT.—American, b 3.25, a 5.13; Brush, a 50, a 80; Brush Illuminating, b 45, a 75; Daft, a 65; Edison Illuminating, b 55, a 70; Edison Isolated, b 50, a 100; Edison European, b 3, a 15; Excelsior, b 20, a 28; Swan Incandescent, a 40; United States, a 110.

BUSINESS NOTICES.

THE PAYNE ENGINE.—B. W. Payne & Sons, Elmira, N. Y., are kept busy supplying the demand for their short-stroke automatic cut-off engine, which is especially adapted for electric lighting. The sizes range from 8 to 80 indicated horse-power.

THE JEROME KIDDER MANUFACTURING CO., of this city, have received the "Medal of Superiority" from the American Institute for fall of 1883 over three competitors for their Superior Electro-Medical Apparatus. This old-established house needs no commendation for the excellence, both of design and manufacture, which renders their machines a standard of quality all over the country.

THE principal New York office of the Palmer Wire Company will hereafter be found at 15 Cortlandt street, in the Smith Building, Room 20, four doors from Broadway, and about equally distant from the Cortlandt Street Station of the Sixth Avenue Elevated Railroad. Those from out of town contemplating a visit to the city can have mail sent to its care, and will find there facilities for writing.

GOODRICH & HOOVER.—This firm, of 180 and 182 Main St., Buffalo, N. Y., manufactures and deals in electrical instruments, telegraph and telephone supplies, and all kinds of batteries, insulated wire, line equipment, etc. The members of the firm are young men. Mr. Goodrich is a thoroughly practical electrician and has been connected with the business for many years. Mr. Hoover looks after sales in the office, finances, etc. The prices quoted by the firm are low, and special estimates will be made whenever desired.

AN INTERESTING PUBLICATION.—A catalogue containing much valuable information in regard to electrical units, tables and rates of interest, approximate measures, analyses of food, division of time, tests for gold and silver, etc., has recently been published by C. E. Jones & Bro., of Cincinnati, O. It is bound in pamphlet form, printed in good type and illustrated. There is a great quantity of interesting reading matter in it for old and young. Besides giving the State laws, foreign exchange, Scriptural weights, measures and money, classification of mail matter, the seven wonders of the world, Voltaire's great riddle, the entire metrical system of weights and measures and the nicknames applied to inhabitants of the various States of the Union, it is a complete compendium of telegraphic and electrical instruments, with prices, directions, illustrations and instructions. The opportunity of obtaining so much useful knowledge for a postage stamp should be seized at once. Send in application to C. E. Jones & Bro., 51 W. Fourth street, Cincinnati, O.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

Edited by N. S. KEITH, Electrical Engineer and Expert, 237 Broadway, New York.

PATENTS DATED FEB. 19, 1884.

Dynamo-Electric Machine; Adolph E. Gustav Lubke, of New York, N. Y..... 293,758

This machine belongs to the class called "unipolar," and the copper conductor which is rotated is in the form of a hollow cylinder, or combined hollow cylinder and disk.

Electric Arc Lamp; Charles L. Buckingham and Henry C. Townsend, of New York, N. Y..... 293,944

This is a variation of No. 293,943. It employs the periodically-closed shunt to divert current from the main circuit, and so far demagnetizing the electro-magnets in the main-circuit, as to cause them to release their armatures and close a second circuit of low resistance around the arc, and to effect the feed of the carbons as well.

Electric Bell-Pull; Augustus S. Bunker, of Lawrence, Mass..... 293,626

A knob, having a spindle which runs in a casing, and is balanced against the pull by a spiral spring encircling the spindle, is provided with a head of conducting material, which is brought into contact with two springs representing two ends of an electric circuit, including an electric call-bell, by the act of pulling a knob, as is usual in ordinary bell-pulls. This contact closes the circuit to ring the bell.

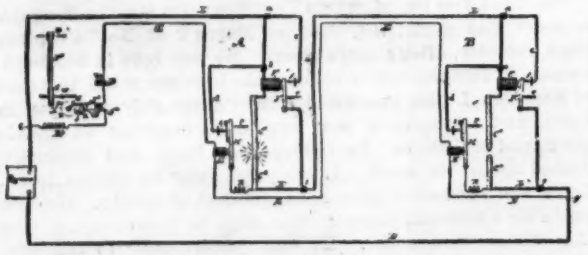
Electric Call-Bell; Dan Boyd, of Manchester, England, assignor to The Domestic Electrical Company, of Boston, Mass..... 293,938

A combination which consists in providing each bell with its own battery. Some details of construction are also presented.

Electro-Magnetic Car Brake; James E. Withers, of Henderson, Ky., assignor to Robert A. Holloway, of same place..... 293,993

On the car axle is placed a friction pulley which bears upon a pulley on a neighboring fixed shaft. When electro-magnets are energized they attract the second pulley, and this turns a drum which winds a chain attached to the brakes.

Cut-Out for Electric Arc Lamps; H. C. Townsend and C. L. Buckingham, of New York, N. Y..... 293,921



This is an improvement on No. 293,943. It consists in providing an auxiliary circuit through which electric impulses are sent at short intervals for the purpose of effecting corrections of abnormal workings of arc lamps; such as too long arcs.

L is the main line; *A* and *B* two arc-lamps, and L^1 is the auxiliary circuit. This last circuit is one derived from the main circuit, as at *i*, and contains resistance R^2 to reduce the quantity of current in that circuit. *P*, *Q*, *W*, *J*, *K*, etc., denote mechanism for intermittently closing, for an instant of time, the derived circuit at stated intervals, say of 3, 4 or 5 minutes. *E* is an electro-magnet in the auxiliary circuit, and it acts to operate the make-and-break armature.

This armature closes and opens the circuit around the arc, and in doing so takes some of the current from the arc for the instant. But this momentary loss is not practically appreciable. But if the arc has become abnormally long, enough current is deflected from the magnet *F* and the arc to weaken the magnet *F*, so that the spring *e* will pull the armature f^1 from its normal seat on the magnet *F* into contact with *f*. T is last movement closes the main circuit around the lamp. This condition is shown at the second lamp.

Electric Gong; Jerome Redding, of Malden, Mass., 293,980

The hammer is operated by clock-work, which is allowed to operate by an electrically operated "let-off." The object is to improve the construction of this class of instruments, and to make it operative by either direct or alternating currents.

Electro-Mechanical Escapement; Henry Van Hoevenbergh, of Elizabeth, N. J..... 293,925

Consists in constructing the escapement device of a telegraphic printing instrument with an armature and an armature lever impelled in one direction through the attractive influence exerted by an electro-magnet included in the circuit of the transmitting device, and in the reverse direction through the influence of an electro-magnet included in the circuit of a local battery.

Electro-Mechanical Movement; Henry Van Hoevenbergh, of Elizabeth, N. J..... 293,924

A variation of apparatus shown in No. 293,923, under which variation but one line wire is used. A commutator is placed on the star-wheel, by which commutator the electric current is put to the electro magnets in succession.

Electric Motor; William T. Waters, of Atlanta, Georgia..... 293,929

Combines a double set of conducting wires with a double set of commutator brushes connected therewith; whereby the motor may be started, stopped or reversed by the operator at any distance on the circuit of the machine.

Electric Safety Device for Elevators; Jacob William DeCastro, of New York, N. Y..... 293,851

The elevator-cage is provided with electro-magnets whose cores are placed so as to run in close neighborhood of the iron slides of the hoistway. When a break of the hoisting-rope occurs the electric circuit which includes the electro magnets is automatically closed and the electro-magnets are thereby strongly energized. The attractive force of the electro-magnets for the iron slides acts to retard or prevent a fall of the cage.

Lock Wire Insulator; Thomas McGrory, of Philadelphia, Pa..... 293,901

An insulator-cup is provided with a slot to its side to admit the wire. The slot is made of an angular form longitudinally, so that the bend in the wire made in laying it in the slot serves to retain it in its position.

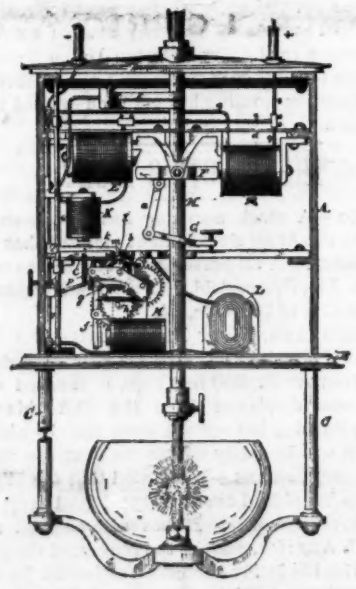
Machine for Laying Electric Conducting Wires; Henry B Cobb, of Wilmington, Del..... 293,632

Consists in mechanism for pushing conducting-wire of any desired length through a tube formed to receive it, avoiding kinks and buckles. Guide-rollers and dies are located near the end of the tube receiving the wire. The grip of the rollers during their rotation effects the pushing of the wire.

Marine Electric Messenger; John C. Henderson, of New York, N. Y..... 293,795

A pilot vessel or messenger is provided with an electric motor for its propulsion; which motor is connected by means of an electric cable with a dynamo-electric machine located on a steamship. The electric current from the dynamo actuates the motor and other electric apparatus on the pilot vessel. The object is to prevent collisions at sea, to take on and put off passengers, freight, etc., sending lines to shore in case of wreck; sending messages from vessel to vessel; and for other obvious uses.

Cut-Out for Electric Lamps; Charles L. Buckingham and Henry C. Townsend, of New York, N. Y... 293,943



E and *D* are the main and shunt magnets respectively. *E* attracts the rocking-lever *F* to raise the clamp *f* to form the arc; and *D* attracts the lever to effect the feed by releasing the clamp. *K* is a magnet in the main circuit. The clock-work mechanism is for the purpose of periodically closing a circuit derived from the main circuit, around the arc and magnets *E* and *K*. This derived circuit includes the resistance *L* and the magnet *M*. A rotary circuit-maker-and-breaker *b* is moved by the clock-work to close the derived circuit for an instant once each 30 seconds, more or less, during the operation of the lamp. If, at any one of the times of make of circuit, the arc be abnormally long, enough current will be shunted through the derived from the main to decrease the magnetism of *K* sufficiently to allow the downward movement of the lever *k* into contact with *f* through its point *m*. This movement closes a circuit of low resistance around the lamp. Normally the difference of potential between the two ends of this derived circuit is not sufficient to force current enough through the derived circuit to practically affect the magnetism of *K*. But when the arc becomes abnormally long the difference in potential is proportionately increased, so that more current is shunted from *K*, therefore so weakens it that *k* falls and closes the circuit around the lamps, as stated. The vibrations of the armature lever *f* effected by the intermittent action of *m* wind the spring which actuates the clock work through successive engagements of the pawl *g* with the ratchet-wheel *h*.

Means for Printing from either of two type-wheels in Printing Telegraphs; Henry Van Hevenbergh, of Elizabeth, N. J..... 293,928

Consists in constructing an instrument with a double electro-magnet for controlling the movements of an escapement device, and two additional independent electromagnets which are respectively adapted to actuate a press lever and to determine the position of a printing platen of peculiar construction.

Multiple Circuit Controller; William F. C. M. McCarty, of Moscow, Russia; assignor to James F. Pierce, trustee, of New York, N. Y..... 293,974

The object is to furnish a telegraph transmitter and electric-circuit controller which shall readily and reliably accomplish the simultaneous and automatic control of a number of electric circuits entirely independent of each other.

Quadruplex Telegraph; Bette E. J. Ells, of Washington, D. C..... 293,956

Consists in so organizing the transmitting system that but a single ground-connection from one of the keys or transmitters is required.

Telegraph-Cable; William R. Patterson, of Chicago, Ill., Assignor to The Western Electric Company, of same place..... 293,775

Consists in providing special test-wires of different lengths; the lengths of the different test-wires being in arithmetical ratio. The length of the shortest wire is the same as the common difference. The object is to provide means by which faults may be located with increased certainty and with less cumbersome and expensive apparatus.

Telegraph Key; Charles Plumb, of Buffalo, N. Y., assignor of one-half to O. P. Babcock, of same place.. 293,979

Uses disc-electrodes placed in same plane, combined with other devices.

Time-Signal for Toll-Lines of Telephone-Exchanges; Augus S. Hibbard, of Milwaukee, Wis., Assignor to The Western Electric Company of Chicago, Ill..... 293,736

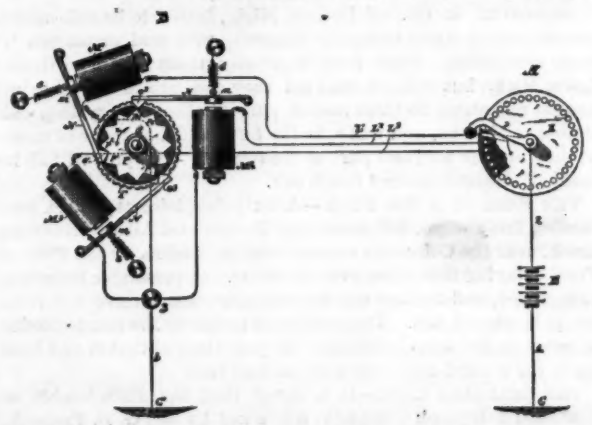
This invention consists in combining a time-piece with mechanism whereby a signal is automatically given to notify the operator that the parties who have been using the line have discontinued. Also, automatic means are provided whereby the subscribers, at the time using the line, may be notified that the limit of time during which they may use the line has expired.

Page-Printing Telegraph; Henry Van Hoevenbergh, of Elizabeth, N. J..... 293,927

Acts to print the received messages in page form. The lateral and vertical spacing is automatically effected.

Electro-Mechanical Movement; Henry Van Hoevenbergh, of Elizabeth, N. J..... 293,923

The electro-magnets M^1, M^2, M^3, have armatures on levers *N*, which have wedge-shaped heads which act to turn the star-wheel



P, when they are brought into engagement by the action of the electro-magnets. The current is sent into the coils of the electro-magnets in succession, by movement of the circuit closer or commutator *K* at the distant, or other, station. The successive engagements of the heads O^1, O^2, O^3, with the teeth of the star-wheel cause its rotation. The direction of the rotation is determined by the order of succession in which the electro-magnets are put in circuit.

Printing Telegraph; Henry Van Hoevenbergh, of Elizabeth, N. J..... 293,922

Consists in combining with the escape-wheel and its anchor an electro-magnet for actuating the anchor in one direction, and in so constructing the teeth of the wheel and an engaging-pallet of the anchor that the propelling force of the instrument, acting through the escape-wheel, will effect the movement of the anchor in the reverse direction. The object is to simplify the construction of the devices used to control the movements of the type-wheel in this class of instruments.

Printing Telegraph; Henry Van Hoevenbergh, of Elizabeth, N. J..... 293,926

Consists in employing successive electric impulses of alternating polarity for successively reversing the magnetic potential of the electro magnet, which is employed for actuating the escapement, and in availing of the residual magnetism contained in the armature at the instant of, or immediately after, each reversal, for momentarily impelling the escapement lever in the direction opposite to that in which it is actuated when the armature has acquired by induction from the electro-magnet magnetism of the character tending to draw the two into proximity.

Underground Electric-Wire Conduit; Charles H. Trask, of Lynn, Mass..... 293,688

Consists of any number of cables of insulated wires laid in a conduit which has tee branches for passing any one cable through at branching points. The tee-branches are provided with tight caps for protection when the cables are not passed through them.

Unison Mechanism for Printing Telegraph; Stephen D. Field, of New York, N. Y..... 293,959

Consists of a combination of devices in the transmitters and receivers, which necessitates the conjoint action of both classes of instruments, the unison devices being automatically brought into or out of action without any care or attention on the part of the operator, and without any cessation of the normal operations of the instruments, excepting such as may be necessitated by a failure of unison in the type wheels, and to bring them to unison.